



Slate Roofing Contractors Association

of North America, Inc.

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GENERAL ARCHITECTURAL STANDARDS FOR INSTALLING NATURAL QUARRIED ROOFING SLATE

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PART 1 — ROOFING SLATE

1.1 PROCUREMENT

- A. Roofing slates are to be procured from known sources so that additional matching supplies can be obtained if needed. A single quarry source is recommended.
- B. Slates shall be supplied by manufacturers that are experienced in the production of roofing slate and that quarry or mine high-quality rock specifically selected for roofing grade applications. Such slates will be supplied with a manufacturer's warranty in writing. Substitution of slates with slates from other sources is not to be permitted without written approval from the Owner or architect.
- C. Slates are to be identified and labeled according to the quarry source and location. For example, slates from Europe are not to be identified as "Vermont" or "Pennsylvania" slates without also clarifying the foreign source.

1.2 QUALITY CONTROL

- A. Slates shall conform to ASTM C 406 and shall be Grade S1 (minimum 575 lbf breaking load¹, maximum 0.25% absorption², and maximum 0.002 inches depth of softening³).

[¹ASTM C120, Test Methods of Flexure Testing of Slate (Breaking Load, Modulus of Rupture, Modulus of Elasticity); ²ASTM C 121, Test Method for Water Absorption of Slate;
³ASTM C 217, Test Method for Weather Resistance of Slate]

- B. All slate shall be hard, dense, sound rock of natural cleft with chamfered (beveled) edges. No broken or cracked slate shall be used, although broken slates may be cut into smaller, unbroken pieces.
- C. The slates shall be machine punched or hand punched for nail holes when of standard thickness (3/16" to 1/4" or 4.8mm to 6.4mm) or optionally drilled and counter-sunk when 3/8" or thicker, for a minimum of two nail holes each. The holes punched in the slates shall be the correct diameter to provide a snug fit for the shank of the roofing nails. Slates shall be punched or drilled back to front (except starter slates, which are punched front to back). Slates are to be punched on the thinner end if there is a variation in the thickness along the length of the slate.
- D. Slates with rectangular corners on the exposed end shall be rejected if a corner is broken off greater than 1.5 inches in either direction, although such slates may be used for cutting into smaller pieces.
- E. Curvature of slates shall not exceed 1/8 inch over a distance of 12 inches. Curved slates shall be trimmed and punched to permit them to be laid with the convex side facing up.

F. Defects in slates such as “knuckles,” “knots,” “knurls” and “cramps” which protrude above the surface of the slates shall be positioned such that they remain on the exposed top surface of the slate after installation. Knots, knurls and cramps are not permitted on the back or covered portions of the slates unless removed by grinding beforehand. A slate shall be rejected if a surface defect adversely affects the proper laying of the slate.

G. Slates are to be free of pyrite inclusions that can visibly leach rust stains onto the roof.

H. Slates shall not have carbon-bearing bands known as “ribbons” as these are considered defects that undermine the longevity of the slate.

I. Nail holes are to be positioned no more than 1.5” in from the side edges of any slates that are 10” wide or narrower. Nail holes must be positioned far enough from the bottom of the slates that the top of the underlying slates will not be penetrated by the slating nails.

PART 2 — GENERAL MATERIALS

2.1 ROOFING FELT

A. All surfaces to be slated are to be covered with a temporary rolled roofing underlayment in order to weather in the building, when needed.

B. Roofing underlayment shall, at a minimum, comply with ASTM D 226 asphalt-saturated rag felt, Type II, No. 30.

C. Felt shall be installed horizontally with sections overlapped toward eaves or drains by a minimum of two inches and at ends by a minimum of six inches. The felt shall overlap hips and ridges by approximately 12 inches. All felt shall be preserved unbroken, tight, and whole.

D. Felt shall be secured with minimum 1” electro-galvanized roofing nails along laps, ends, and in the field as necessary to properly hold the felt in place and to protect the building from water infiltration until covered with slate.

E. The maximum length of exposure for felts prior to slating shall be one month. When the felt must be left for long periods before the slates can be installed, the exposed nail heads are to be skimmed over with a thin layer of trowel grade roof mastic to prevent leakage around the nail heads.

F. When self-adhesive underlayment is used along eaves or elsewhere, it is to be covered with felt.

G. On slopes from 4:12 to 12:12, a double layer of 30 lb felt, or a single layer of 40 lb. felt is recommended when the felt is not going to be slated over immediately. Slopes over 12:12 may use a single layer of felt as may any slope that is to be slated within a few days.

2.2 NAILS

A. Nails shall be solid copper, smooth-shank roofing nails, minimum 11 gauge, minimum 1.25” length. Copper nails 2.5” or longer shall be minimum 10 gauge. Alternatively, Type 304 smooth-shank stainless steel roofing nails can be used, not less than 1.25” long.

B. Hot-dipped galvanized smooth-shank roofing nails may be utilized when specified.

C. Nail length is to be approximately twice the thickness of the slates plus one inch. Nails are to fully embed into the roof decking material without more than 1/4" nail length being exposed on the underside of the roof decking. When the underside of the roof decking is exposed, such as at overhanging eaves, the nails shall be long enough to penetrate the roof decking, but not so long that they may be visibly driven through.

D. Recommended nail lengths are as follows when installing on 1" or thicker roof deck:

1. 3/16"-1/4" thick slates are to be fastened with 1.5" nails.
2. 3/8" thick slates are to be fastened with 1.75" nails.
3. 1/2" thick slates are to be fastened with 2" nails.
4. 3/4" thick slates are to be fastened with 2.5" nails.
5. 1" thick slates are to be fastened with 3" nails.

2.3 FLASHING

A. Flashing shall be minimum 16 ounce copper conforming to ASTM B 370, or minimum 28 gauge stainless steel. Minimum 20 ounce copper flashing is recommended.

B. Flashing shall be installed where there are roof plane intersections, where the roof abuts walls, parapets, dormers and chimneys, or where there are roof penetrations.

C. All flashings and fasteners are to be galvanically compatible metals.

D. The SMACNA "Architectural Sheet Metal Manual" and the publication "Copper and Common Sense" by Revere Copper Products are recommended as guidebooks for flashing installations.

2.4 MASTIC

A. Roof mastic shall be non-asbestos fibered asphalt cement complying with ASTM D 4586.

B. Roof mastic shall be designed for trowel application.

2.5 SLATE HOOKS

A. Slate hooks shall be minimum three inches long, solid copper or stainless steel.

B. Standard slate hooks are for use with slate of commercial standard thickness only. Custom slate hooks may be fabricated by the Contractor for use with slates up to 1/2" in thickness.

2.6 CANTS

A. Wood cants for installing underneath the starter course of slate shingles shall be minimum 1/4 inch by 1 inch plaster lath or other solid, glue-free wood. Alternatively, minimum 16 ounce copper or 28 gauge stainless steel edging with a built-in cant may be used.

B. When installing standard thickness slates (3/16" to 1/4" thick) the cant should be approximately 1/4" to 3/8". Thicker slates will require a greater cant.

2.7 ROOF DECKING

A. The roof deck is recommended to be a minimum of 3/4" thick, solid, glue-free wood.

- B. Nailable concrete and gypsum concrete are also suitable roof decking materials.
- C. Minimum 3/4" glue-free slating lath or skip sheathing can be spaced on rafters as a nailing substrate.
- D. Minimum 3/4" glue-free boards, slating lath or skip sheathing can be installed over glued or laminated roof decks to provide a suitable nailing substrate.

PART 3 — SLATE EXECUTION

3.1 FASTENERS

- A. All standard slates shall be fastened with minimum of two roofing nails fastened above the head of the underlying slate and as far from the center of the fastened slate as is practical.
- B. Larger, heavier slates may need four nails per slate with the extra two nails positioned above, not beside, the original nails.
- C. Screws are not to be used when fastening slates.
- D. Slates overlapping sheet metal shall have the nails placed so as to minimize puncturing the metal.
- E. Exposed nail heads are not permissible except where unavoidable. Any exposed nail heads shall be sealed with gaskets or approved sealants. The application of slate dust to cover exposed sealants is recommended.
- F. Nails shall not be driven in so far as to produce an excessive strain on the slates, and shall instead be driven to a depth such that the nail heads lie within the counter-sunk nail hole and do not rub excessively against the overlying slates.
- G. Use of pneumatic or electric nail guns to install natural quarried slate shingles shall not be permitted.
- H. Slates are not to be bedded in roof mastic or other adhesives except where absolutely necessary such as at exposed edges in high-wind areas.
- I. Ridges and hips shall be installed without exposed fasteners whenever possible.
- J. If a slating nail is installed in a crack or hole in the sheathing, it shall be renailed properly.

3.2 HEADLAP

- A. All standard field slates shall be installed with a minimum 3" head lap when the roof slope is 8:12 up to 20:12.
- B. On slopes 20:12 or greater, slates may be installed with a 2" headlap.
- C. Less than an 8:12 slope down to 4:12, the slates shall be installed with a minimum 4" headlap.
- D. Installing roofing slates on slopes less than 4:12 is not recommended.
- E. Headlaps may be increased at ice-dam prone or poor drainage areas.

3.3 EAVES SLATES, EDGE SLATES AND STARTER COURSES

- A. Eave slates shall be laid to provide a minimum 1.5" projection beyond the furthest extent of the fascia, cornice, crown molding, metal drip edge, trim, or other construction material at the eaves.
- B. Rake edge (gable end) slates shall extend minimum 1" beyond the furthest extent of the gable trim, fascia or drip edge.
- C. Slates at the eaves shall be doubled by first installing a slate starter or under-eave course installed back side up (chamfered side down). The first course of slate shall be laid over the starter course so that the drip edges of both courses align flush. The first course of slates shall break side-butt joints with the starter course side-butt joints by not less than 3". The second course of slates must overlap the starter course by a minimum of 3" and not less than the general headlap of the field slates along the eaves [see Figure 1].
- D. The starter course of slates is to be canted to allow the starter slates to be tilted to the same angle as the field slates. The cant strip may be a solid, glue-free wood strip. Alternatively, a minimum 16 ounce copper or 28 gauge stainless steel drip edge with a cant built-in may be utilized.

3.4 SLATE INSTALLATION

- A. Slate shall be installed starting at the bottom or eaves and proceeding toward the ridge or top.
- B. All slates will be installed following straight chalk lines marking the top edge of each course of slates, whenever possible.
- C. When supplied on pallets, slates are not to be used from one pallet at a time, but are to be used from all pallets simultaneously in order to blend the various pallets uniformly on the roof.
- D. Slate side-butt joints shall be positioned as near the mid-point of the underlying slates as possible, and not less than 3" from the underlying side-butts. Each slate course shall break butt-joints laterally by a minimum of 3", if possible, with the underlying or overlying courses.
- E. When installed, slates shall be butted side-to-side touching, or with a maximum 1/8" gap between slates, on average.
- F. Slate will be neatly fitted around any pipes, ventilators, and other roof penetrations.
- G. Slates are to be cut from the back side in order to preserve the chamfered edge on the front exposed surface. Use of grinders, saws, or other mechanical means to cut and trim roofing slates shall not be permitted unless the slates maintain a chamfered appearance along the exposed sawn edges. At the apex of slated hips and ridges, and at the juncture of a closed valley, the chamfered edge may, as an option, be reversed to create a tighter fitting joint.
- H. In ice-dam prone areas, slates may be installed with an increased headlap. Additional underlayment may also be used in ice-dam prone areas, such as Type II felt installed on top of the existing felt, with a layer of trowel-grade roof mastic spread evenly underneath the additional felt layer.
- I. Slates along valleys shall be cut in neat and straight lines. Valley slates are to be cut on the back side of the slate to maintain a chamfered slate edge along an open valley.
- J. Contractor shall visually and manually inspect the slates when roof brackets are removed to make

sure no slates were broken by the roof scaffolding. Upon completion, all slate shall be sound, unbroken, un-cracked, whole and clean, showing no exposed roof cement.

K. Individual slates that must be installed in the field of the roof after the installation is complete, such as where a roof bracket had been removed or where a repair has been made, shall be installed using stainless steel or copper slate hooks or the “nail and hidden bib” installation method where standard nailing is not possible. Slates thicker than 1/2” may require the “nail and bib,” rather than a slate hook fastener.

PART 4 — ASTM REFERENCES

ASTM A167 — Type 304 Terne coated stainless steel, 0.015 inch (0.38 mm) thick stainless steel core material, coated with 0.092 lb/sq ft (450 g/sq m) Terne alloy on both sides.

ASTM A666 — Type 304 stainless steel, soft annealed 2D finish (unless harder temper is required for forming or performance), 0.0156 inch (0.4 mm) thick.

ASTM B101 — Specification for Lead-Coated Copper Sheet and Strip for Building Construction.

ASTM B370 — Specification for Copper Sheet and Strip for Building Construction.

ASTM B749 — Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.

ASTM C406 — Specification for Roofing Slate.

ASTM C920 — Specification for Elastomeric Joint Sealants.

ASTM C1311 — Specification for Solvent Release Sealants.

ASTM D312 — Specification for Asphalt Used in Roofing.

ASTM D1079 — Standard Terminology Relating to Roofing, Waterproofing, and Bituminous Materials.

ASTM D1970 — Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

ASTM D2626 — Specification for Asphalt-Saturated and Coated Organic Felt Base Roofing Sheet.

ASTM D2822 Specification for Asphalt Roof Cement, Asbestos-Containing.

ASTM D3019 — Specification for Lap Cement Used with Asphalt Roll Roofing, Non Fibered, Asbestos, Fibered, and Non Asbestos Fibered.

ASTM D4022 — Specification for Coal Tar Roof Cement, Asbestos Containing.

ASTM D4586 — Specification for Asphalt Roof Cement, Asbestos-Free.

ASTM D4869 — Specification for Asphalt-Saturated Organic Felt Underlayment for Steep Slope Roofing.

PART 5 — SLATE GRADES, SIZES COLORS AND HEADLAPS

5.1 SLATE QUALITY

A. ASTM C 406 Grade S1: Expected service life in excess of 75 years.

B. ASTM C 406 Grade S2: Expected service life 40-75 years.

C. ASTM C 406 Grade S3: Expected service life 20-40 years.

5.2 SLATE THICKNESSES

A. Thicknesses

1. Standards; Nominal 3/16 inch (5 mm) to 1/4 inch (7 mm)

2. Quarters; Nominal 1/4 inch (7 mm) to 3/8 inch (10 mm)

3. Heavies; Nominal 3/8 inch (10 mm) to 1/2 inch (13 mm)

4. Extra Heavies; Nominal 1/2 inch (13 mm) to 3/4 inch (19 mm)

5.3 STANDARD SLATE SIZES

1. 24"L X 14"W (610 mm X 356mm)
2. 24"L X 12"W (610 mm X 305 mm)
3. 22"L X 12"W (559 mm X 305 mm)
4. 22"L X 11"W (559 mm X 279 mm)
5. 20"L X 14"W (508 mm X 356 mm)
6. 20"L X 12"W (508 mm X 305 mm)
7. 20"L X 11"W (508 mm X 279 mm)
8. 20"L X 10"W (508 mm X 254 mm)
9. 18"L X 14"W (457 mm X 356 mm)
10. 18"L X 12"W (457 mm X 305 mm)
11. 18"L X 11"W (457 mm X 279 mm)
12. 18"L X 10"W (457 mm X 254 mm)
13. 18"L X 9"W (457 mm X 229 mm)
14. 16"L X 14"W (406 mm X 356 mm)
15. 16"L X 12"W (406 mm X 305 mm)
16. 16"L X 11"W (406 mm X 279 mm)
17. 16"L X 10"W (406 mm X 254 mm)
18. 16"L X 9"W (406 mm X 229 mm)
19. 16"L X 8"W (406 mm X 203 mm)
20. 14"L X 10" W (356 mm X 254 mm)
21. 14"L X 9"W (356 mm X 229 mm)
22. 14"L X 8"W (356 mm X 203 mm)
23. 14"L X 7"W (356 mm X 178 mm)
24. 12"L X 10"W (305 mm X 254 mm)
25. 12"L X 9"W (305 mm X 229 mm)
26. 12"L X 8"W (305 mm X 203 mm)
27. 12"L X 7"W (305 mm X 178 mm)
28. 12"L X 6"W (305 mm X 152 mm)

5.4 NORTH AMERICAN ROOFING SLATE COLORS

1. Unfading Black
2. Semi-Weathering Gray/Black
3. Unfading Gray
4. Semi-Weathering Gray
5. Unfading Purple
6. Semi-Weathering Purple
7. Unfading Mottled Green and Purple
8. Unfading Green
9. Semi-Weathering Green (Sea Green, Gray/Green)
10. Unfading Red

5.5 SLATE EXPOSURES AND HEADLAPS

When Using 3" and 4" Headlaps (showing Number of Slates per Square)

<u>Slate Size (in.)</u>	<u>Exposure (3" H.L.)</u>	<u>(Slates/Square)</u>	<u>Exp. 4" Headlap</u>	<u>(Slates/Square)</u>
6x10.....	3 1/2".....	686.....	3".....	800
7x10.....	3 1/2".....	588.....	3".....	686
8x10.....	3 1/2".....	514.....	3".....	600
6x12.....	4 1/2".....	533.....	4".....	600
7x12.....	4 1/2".....	457.....	4".....	515
8x12.....	4 1/2".....	400.....	4".....	450
9x12.....	4 1/2".....	355.....	4".....	400
10x12.....	4 1/2".....	320.....	4".....	360
7x14.....	5 1/2".....	374.....	5".....	412
8x14.....	5 1/2".....	327.....	5".....	360
9x14.....	5 1/2".....	290.....	5".....	320
10x14.....	5 1/2".....	261.....	5".....	288
12x14.....	5 1/2".....	218.....	5".....	240
8x16.....	6 1/2".....	277.....	6".....	300
9x16.....	6 1/2".....	246.....	6".....	256
10x16.....	6 1/2".....	222.....	6".....	230
12x16.....	6 1/2".....	185.....	6".....	192
9x18.....	7 1/2".....	213.....	7".....	221
10x18.....	7 1/2".....	192.....	7".....	199
11x18.....	7 1/2".....	175.....	7".....	187
12x18.....	7 1/2".....	160.....	7".....	171
10x20.....	8 1/2".....	170.....	8".....	180
11x20.....	8 1/2".....	154.....	8".....	164
12x20.....	8 1/2".....	141.....	8".....	150
14x20.....	8 1/2".....	121.....	8".....	129
11x22.....	9 1/2".....	138.....	9".....	146
12x22.....	9 1/2".....	126.....	9".....	134
14x22.....	9 1/2".....	109.....	9".....	115
12x24.....	10 1/2".....	114.....	10".....	120
14x24.....	10 1/2".....	98.....	10".....	103

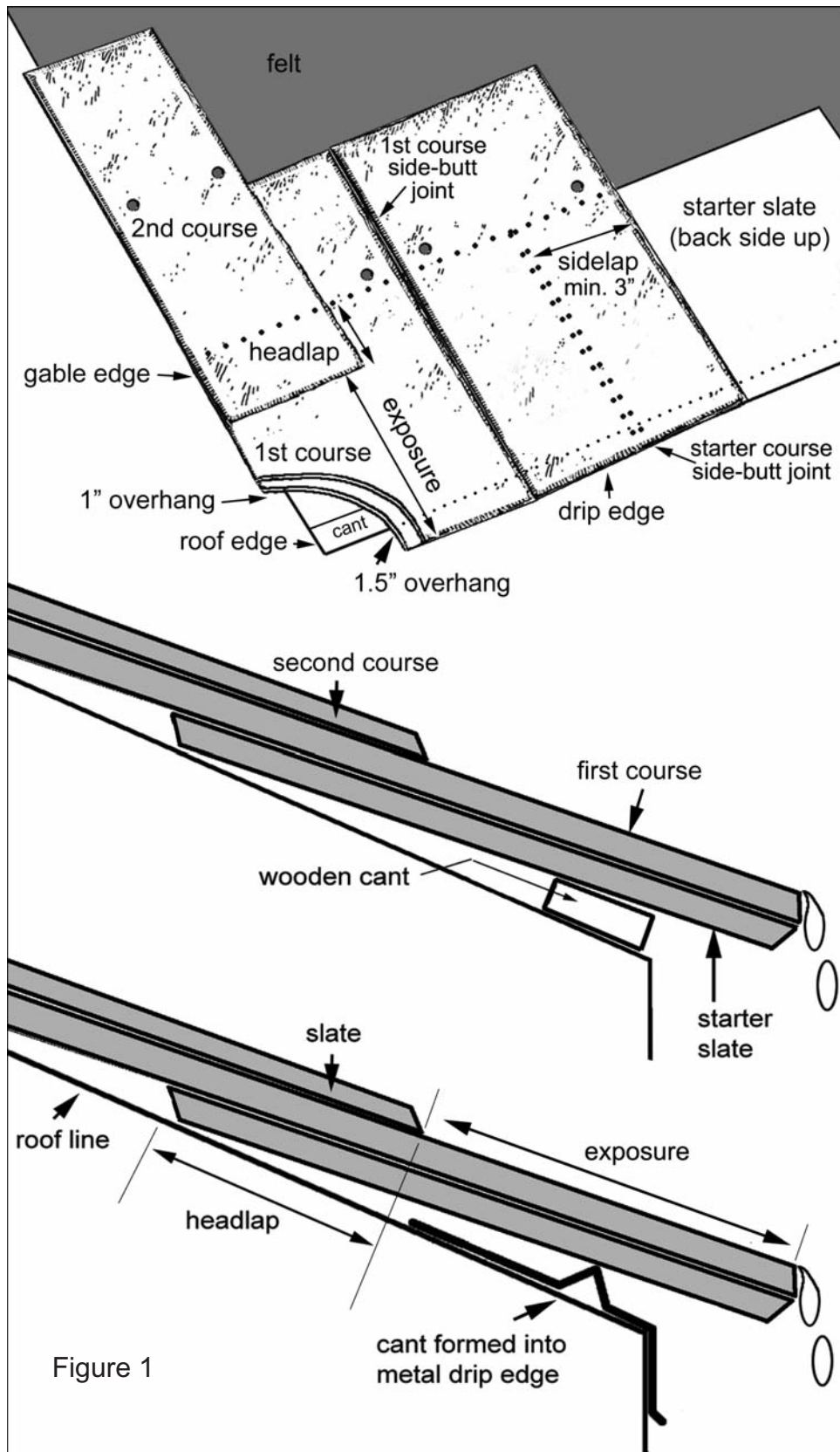


Figure 1